

reserved for recurrent lesions. In chronic lesions and cuff tears a local injection may relieve pain and allow exercise to strengthen the cuff muscles; the injection may be repeated after several months if necessary. From a lateral approach the needle is inserted horizontally below the acromion to a depth of 3-4 cm. When the needle is in the subacromial bursa injection is effortless. If lignocaine is added the temporary relief of pain indicates that the problem has been located. Primary infection of the shoulder joint is rare and the risk of introducing infection small. The main worry is that multiple injections may damage the rotator cuff, so injections should be limited to two. If the problem persists the patient should be referred to a rheumatologist or orthopaedic surgeon.

Injection of joints and regular assessment of the elderly are both encouraged by the new general practice contract. The hypothesis that many elderly people could be helped by

steroid injection of the shoulder should be tested in general practice and the safety and timing of repeated injections established.

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## Low level exposure to lead

### *The evidence for harm accumulates*

Ten years ago, researchers were still debating whether lead at concentrations too low to cause clinical effects might be harmful. In 1979 Needleman *et al* claimed that asymptomatic children with biochemical evidence of increased lead absorption showed deficits on psychological testing and in classroom performance.<sup>1,2</sup> At first it was not easy to sustain that contention.<sup>3</sup>

Many problems face investigators. What measure of lead exposure should be used—blood lead concentration, which necessitates venepuncture and reflects only very recent exposure, or some integrated measurement such as the lead content of deciduous teeth or, perhaps, hair? What measure of effect should be used? Modern cognitive psychological testing offers a range of possible outcome variables. These variables—usually a battery of psychological tests—will almost certainly be susceptible to many other factors, some of which may be associated with lead exposure (confounders) whereas some may interact with it. The other factors affecting the outcome include socioeconomic variables such as social class, mother's intelligence quotient, parental education, parents' vocabulary, and medical variables such as gestation period, birth weight, medical history, and even sex. If any effects do occur are they transient, disappearing when exposure stops, or permanent?

Furthermore, analysing the findings presents problems. The pitfalls of analysing data with many confounding variables may be obvious in retrospect—and there are statistical techniques for handling them—but their avoidance requires some intellectual rigour. The uncritical use of computers may produce large numbers of exploratory analyses in the search for some "statistically significant" results. Also, the large number of outcome variables means that one of them might well show a statistical association just by chance. Such fishing expeditions will produce some spurious results and, equally, they may indicate important associations between lead and one or more psychological measures, but these associations may not reach conventional levels of significance.

How are these difficulties to be tackled? Two main methods have been used. Firstly, measurement of probability is moving towards expression of confidence intervals and away from the more rigid division between "significant" and "non-

significant." Secondly, analyses should be "hypothesis driven" from the outset to avoid the problems of dredging data for "significant" associations.

### Confirmation of an association

In the 10 years since the study by Needleman *et al* several studies have been reported from North America, Europe, and Australia. Most of the studies have accounted for the confounding variables and they nearly all point to an inverse relation between blood lead concentrations, or lead body burden, and some measure of psychometric intelligence or cognitive performance. Among the variables that have been explored, one interesting and important interaction has emerged. Children from families in the lower socioeconomic groups seem more vulnerable to the effects of lead than children from more favoured backgrounds.<sup>4,5</sup>

That observation could account for some apparently discordant results. For example, a study from Sydney, Australia, of children aged up to 4 years from a well educated middle class population showed no association between psychological developmental outcomes and lead concentrations in either cord blood or subsequent six monthly blood samples (used to give an approximate integrated dose).<sup>6</sup> The blood lead concentrations at 3 and 4 years were, respectively, 0.58  $\mu\text{mol/l}$  and 0.48  $\mu\text{mol/l}$ . On the other hand, children from another Australian town immediately downwind of a large lead smelting facility showed lower general cognitive scores and similar deficits in perceptual performance and memory scores.<sup>7</sup> The postnatal blood lead concentrations at each age were inversely related to those scores, but the relations with antenatal and perinatal blood lead concentrations were less strong. In that study the mean blood lead concentrations at 3 and 4 years were 0.91  $\mu\text{mol/l}$  and 0.76  $\mu\text{mol/l}$ . Do the results of these two studies indicate a threshold, somewhere about 0.48-0.72  $\mu\text{mol/l}$  of blood lead concentration, below which effects are not seen,<sup>8</sup> or is the lack of effect in the group with lower lead concentrations explained by an interaction with their (more favoured) background? Comparing these results with an earlier longitudinal study of their own,<sup>9</sup> Bellinger *et al* commented on the fact that they too had found that children's ability scores at the age of 4

or older were associated with postnatal exposure to lead, particularly the value measured at 2 years.<sup>10</sup> Although the scores at lower ages were strongly related to the level of prenatal lead exposure of these children, they found, like McMichael *et al.*,<sup>7</sup> that the scores at the age of 4 were not. They pointed out that the distribution of blood lead concentrations in their study was lower than that in the Australian one and claimed that, taken together, the two studies showed a common negative regression between the score on the general cognitive index and the logarithm of the blood lead concentration.

The problem of whether findings are significant or not significant has also been tackled. For example, the non-significant results from a London study<sup>11 12</sup> at first sight contrast with the significant results from a study in Edinburgh.<sup>13</sup> A subsequent note focused on the size of the associations and on the confidence intervals and suggested that the two studies were in fact consistent in pointing toward a weak inverse association.<sup>14</sup>

Which way does the arrow of causation point? Does the high lead concentration impair cognitive performance or do disadvantaged and less able children play outside in the dirt and ingest more lead while their more literate brethren stay indoors to read? Two prospective studies show that the concentration of lead in umbilical cord blood predicts later intelligence, such that an increase of about 0.48 µmol/l of lead is associated with a decrease in mean intelligence quotient of 4.5 points measured later in life.<sup>9 15</sup>

### Questions of public health

As the evidence accumulates that fetal, and perhaps also infant, exposure to lead affects cognitive development other questions arise.<sup>16</sup> Will the effects disappear once the child is removed from exposure and the blood lead concentration falls? How great are the effects compared with the multitude of other factors that may also adversely affect cognitive development? Is there a safe threshold of exposure to lead or of lead absorption? Finally, what do we understand of the psychological mechanisms concerned and of the neurochemistry?

A possible answer to the first of these questions has recently appeared. An 11 year follow up of some of the original group studied in the late 1970s shows that those children with more lead in their deciduous teeth subsequently had a higher risk of dropping out of high school and of having a reading disability and lower vocabulary and grammatical/reasoning scores.<sup>12 17</sup> At follow up the children seemed to have had negligible current exposure to lead, for the investigators abandoned the measurement of blood lead concentrations when none of the first 48 children (out of 132) were found to have blood lead concentrations greater than 0.34 µmol/l. This follow up group was not typical of the original group for the selection turned out to be biased towards children who had lower dentine lead concentrations and were from more highly educated families of higher socioeconomic state—all factors tending to reduce any effects of lead. Furthermore, the retested subgroup contained a higher proportion of girls, which might also have reduced the observed deleterious effects of lead.<sup>18</sup> Those results seem to conflict with those of a smaller prospective study of 2 year olds with evidence of overexposure to lead up to their first birthday.<sup>19</sup> Regression analysis failed to identify factors related to lead as significant predictors of psychological function, although assessment of home environment and birth weight proved to be reliable predictors of cognitive state at 2 years of age. Additionally, both Australian studies are proceeding and the children, now aged 7, are being reassessed.<sup>8</sup>

The deleterious effects of lead may be modest. Intelligence quotient falls only a few points for a doubling of blood lead concentrations. Compared with the effects of other factors this is a small change, but in view of the many children who might be affected, it has been argued that small should not be taken to mean biologically or socially unimportant.<sup>20-22</sup> When a variable seems to have a modest but potentially important effect the possibility of publication bias needs to be considered,<sup>23 24</sup> although there are no data on this for studies of lead exposure.

For prevention it would be convenient if there was a safe threshold of lead exposure. There may, however, be no such threshold,<sup>7 10 13 25</sup> although at progressively lower levels of lead exposure it has been increasingly difficult to distinguish any effect of lead from the larger effect of many confounding variables.

Stollery *et al.* suggested that in adults exposed to lead a general slowness in responding might underlie previous reports of cognitive impairment.<sup>26</sup> Whether this could account for some effects observed in children, such as low scores on teacher assessments or high school drop out rate, is debatable. One recent animal study that looked at the neurochemical effects of lead in low doses showed the mid brain and diencephalon to be the prime targets, with alterations in both the catecholaminergic and the cholinergic systems.<sup>27</sup>

The increasing acceptance that the brain, particularly the developing brain, may be the critical organ for the action of lead has profound implications for preventive medicine.<sup>21 28-30</sup> Only 10 years ago occupational physicians regarded blood lead concentrations up to 3.86 µmol/l as acceptable. With the ever stronger evidence that even a modest rise in maternal, or early childhood, blood lead concentrations may lead to lasting harm, the implications—both for lead exposure in women of childbearing capacity and for public health measures—are likely to be far reaching.

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## Training for care assistants

### *New qualifications should raise their status and scope*

Half a million people in Britain are employed under the broad title of health and social care assistants. Over 150 000 work in the health service as nursing auxiliaries, occupational therapy helpers, physiotherapy aides, foot care assistants, and so on. Outside hospital, people with similar skills and aptitudes are employed as home care workers (home helps and home care aides) or residential and day centre care assistants. Local authorities are currently the main employers of home care workers, but over half of all residential care assistants are now employed in the independent sector. Most of these employees are women working part time, and their work is traditionally of low status and poorly paid. This week's announcement of the two new national vocational qualifications for these workers should help improve their training, status, and effectiveness.

Three major factors have forced a national rethink about the training and development of this crucial work force. Firstly, Project 2000 has already begun to remove learner nurses from wards, leaving a serious labour gap. Secondly, the decline in the numbers of school leavers means that other service industry jobs will be competing for the traditional caring work force. Caring for people is potentially very satisfying, but it may be stressful and physically demanding. The job can be made more attractive by training and recognising skills through qualifications, creating opportunities for personal development. Thirdly, the rising number of seriously disabled old people living at home or in residential care and other groups needing community care has created a demand for a new breed of carer. This new carer needs both practical skills and an understanding of the emotional, intellectual, and social difficulties of people with long term disabilities far beyond those expected of a traditional home help.

National vocational qualifications were launched in 1986 to meet the national need to improve poor skills among unqualified adults in all industrial sectors. The idea is that vocational training focused on employment and based on the job should lead to nationally agreed qualifications. Access to training should be as open as possible and qualifications should be awarded on a mixture of assessments on the job and more formal training. Employees acquire credits which can be taken to other jobs in the same sector and build up a specific vocational qualification at their own speed.

The Care Sector Consortium was formed in 1987 of health and social care employers, unions, training bodies, and professional organisations to develop national vocational qualifications for the health care sector. Its remarkable achievement is to have produced agreement on core skills and competencies as a basis for the five national vocational qualifications launched this week—three for health care assistants and two for residential, domiciliary, and day care

staff. One disappointment is that there will be no "generic health care worker" qualification despite the fact that residential care assistants perform similar tasks to ward based nursing auxiliaries. The original aim of producing an integrated system of credits across sectors has not been achieved, largely because of the urgent need to produce guidance for the NHS on support work training, although work will continue to produce an integrated scheme of portable credits during this year. This should improve the career opportunities and mobility of workers between hospital and community and lead to a better understanding of each other's work. The professions have always been unenthusiastic about the concept of a generic worker, but there may be a sensible move in that direction as employees acquire portable credits.

In creating more qualifications there is a risk of further overprofessionalisation, a tendency which already bedevils the health service. Also, educationally disadvantaged people with the right personal qualities may be deterred from applying. Open access is important, but the qualification must be meaningful and demonstrate real knowledge and skills. The joint awarding bodies are aware of the need to ensure that the assessment process is relevant to the job. Training the trainers and assessors will therefore be crucial for employers and will need financial investment and the commitment of senior managers. The NHS Management Executive could clearly signal the importance of this work force by allocating funds for developing this training.

One matter remains unresolved. Health service nursing unions had hoped that support workers would have nationally agreed terms and pay negotiated through Whitley Council machinery. If I were a support worker I would say "no thanks." A very broad range of different jobs is likely to emerge under the umbrella of support worker, and because of the wide social differences in local working populations employers will require maximum flexibility to shape and reward the newly created jobs. No nationally agreed reward scheme is likely to provide sufficient flexibility. Unions can play a vital part in developing the pay and conditions of this low paid group, but their collective might needs to be used more creatively.

Doctors should welcome the launch of this quiet but far reaching revolution in health care training. It has enormous potential for improving the quality of care experienced by patients. The future effectiveness of NHS and community care services will in large part depend on its success.

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